

BUILDINGS & FLEET/DPW



FLEET MAINTENANCE MANUAL

AUGUST, 2008

Index

Introduction.....	1
Fleet Services.....	2
Maintenance Facilities	3
Preventive Maintenance	6
Scheduled Preventive Maintenance Program.....	6
Planning a Preventive Maintenance Program.....	6
Operator Responsibilities.....	7
Scheduling Preventive Maintenance.....	7
Service Intervals	7
Service Checklists	9
Equipment Condition Report (<i>Sample 1</i>).....	11
Preventive Maintenance Forms	12
Repair Orders and Pre-Trip Inspections	12
Pre-Trip Inspection Form (<i>Sample 2</i>)	13
PM Compliance Tables	14
Percent of Work Orders – PM vs. Repairs.....	15
Preventive Maintenance Committee.....	16
Call-In Procedure-Light Equipment.....	16
PM Schedule-Light Equipment	17
Call-In Procedure-Heavy Equipment	17
PM Schedule-Heavy Equipment.....	18
Tire Shop.....	19

Introduction

For most government agencies, fleet/equipment services impact the delivery and cost of nearly every service provided to the public and impact the productivity of nearly every employee, support emergency services making the difference in every citizen in the City, and support maintenance of infrastructure which helps support local economy and quality of life.

Preventive maintenance and reactive maintenance are an extremely critical part of fleet operations. We have created a Preventive Maintenance Team to decrease the incidents of equipment arriving late for the PM's they are due for. This team has been charged with overhauling the complete PM program from the intervals to the locations the PM's are completed.

If the Preventive maintenance program is working correctly the reactive maintenance should decrease as well. The reactive maintenance is the repair request that is written up by the operators at the end of their day. These repairs must be completed overnight enabling the crews to continue their work in the morning.

Fleet Services

Fleet Services purchases, maintains and fuels a fleet of over 4000 light and heavy vehicles and components such as plows, leaf attachments and salt hoppers for the City of Milwaukee. This number also includes police vehicles. Fleet Services does not perform PM's on Police vehicles but does perform all repairs. The types of equipment range from small soil compactors to Police Vehicles, through heavy duty trucks, off-road construction equipment and certain specialty equipment. Other than supporting DPW operations, the department provides equipment to other city agencies.

Skilled technicians, welders, body men, tire men, and parts personnel along with their supervisors work at various city garages to keep the fleet properly maintained. The department also dispenses gasoline and diesel fuel at nine locations throughout the City and propane at selected sites. Facilities include the Central Repair Garage as headquarters and three field garages. A centralized dispatch and operator training program are also run from the Central Repair Garage through the Dispatch section of Fleet Services.

Fleet Services operates Fleet Focus, a computerized fleet maintenance information system, to track all of the units, repairs and maintenance costs, and to schedule vehicles for periodic maintenance work. The system also records fuel dispensed to each vehicle. The City Of Milwaukee has installed the Fuel Focus system component of Fleet Focus. This system gives us real time entry of fuel transactions into the fleet management system. We will also utilize some new technology on all newer equipment. The operator will no longer enter the vehicle mileage when fueling. There will be a ring around the fuel tank neck that will take the mileage from the vehicle and enter it into the vehicle information on Fleet Focus. This will give provide greater accuracy, allowing the Preventive Maintenance program better information in scheduling the PM's. The installations of this equipment were started in late 2007 and should be complete by the end of 2008. We will install 1199 of the units on the newest vehicles. From this time forward all new equipment will have the rings installed before they are placed into service.

Maintenance Facilities

More than 93 skilled employees and their supervisors work at various city garages to keep the fleet properly maintained. Facilities include the Central Repair Garage as headquarters, Ruby Garage, Lincoln and the newest location is at the DPW Field Headquarters.

The Central Garage is also the location of the Dispatch Office. The Dispatch Office schedules the daily assignments of 400 Operation Driver Workers and directs the DPW equipment operator training program which provides driver training to more than 700 employees. Here is a short explanation of the type of work performed at each repair facility within Fleet Services.

Central Garage: 2142 W. Canal Street

Central Garage is the main repair facility for the City of Milwaukee. It is divided into two sections Light and Heavy Repairs, houses the central parts stockroom, a fully equipped body shop, and the Dispatch Office.



Light Repairs services all the Milwaukee Police Departments vehicles along with all DPW light vehicles. Light equipment is defines as being 12,000 pounds or less. They are responsible for about 650 Police vehicles and almost 1000 other City vehicles and equipment.



Heavy Repairs has the duty of performing all the major repairs sent to Central Garage by the other three locations. The Maintenance Mechanics and Body Men also do all the plow repairs after every plowing operation. The Maintenance Mechanics also perform most of the welding and fabricating on the fleet. The body men do all the decaling and whatever painting is necessary before a new piece of equipment is put into service



At Central Repair Garage phase two of the project to modernize the facility is in full swing. Lighting, painting, air delivery systems, fluid delivery systems and hoist replacements are some of the projects within phase two. HVAC, electrical and the roof through the center section of the building were all part of phase one which was completed in the fall of 2007

Northwest (Ruby): 3025 W. Ruby Avenue

The Northwest Garage performs a variety of repair and preventive maintenance activities for heavy equipment. The technicians at Northwest garage concentrate on getting the daily request for repairs from the drivers completed on second shift. It also services refuse packers and Forestry equipment that park at the Industrial Road site, about four miles away. The facility is the original city heavy equipment repair facility and is in need of a major upgrade or replacement.



Lincoln: 3921 W. Lincoln Avenue

Lincoln Garage performs much like Northwest garage. They concentrate on quick repairs and preventive maintenance so the equipment will be operational for the beginning of the next shift. While having had some upgrades to its facilities, there are still facility elements that warrant consideration in 2008.

**Tire Shop: 123 N. 25th Street**

The Tire Shop is a state of the art tire maintenance facility developed during 2004. It was designed from the ground up as a tire service facility and has demonstrated its superiority over a “make-do” alternative. It is centrally located and is in close proximity to Central Garage. The Tire Shop has been instrumental in exploring opportunities in tire longevity. Nitrogen is one of those opportunities.

**DPW Field Headquarters: 3850 N. 35th Street**

The DPW Field Headquarters serves as the centralized parking location for many DPW vehicles. Included at the site is a Fleet Services preventive maintenance and minor repair facility. The three employees, two Heavy Technicians and one Garage attendant service the approximately 500 vehicles parking at this location. They perform all PM and some minor maintenance on the equipment parking at DPW FHQ.



Preventive Maintenance

In a perfect situation all repairs to every vehicle would be completed in a planned preventive maintenance (PM) program. From the time a vehicle was purchased until it was sold, all repairs would be predicted and prevented. One hundred percent of all shop labor and parts would be attributed to preventive maintenance (PM). Shop scheduling would be much easier. Breakdowns, road calls, and downtime would be virtually nonexistent. Equipment would be safe and dependable. Operating costs would be minimal. In the real world, however, this does not happen.

A scheduled preventive maintenance program is a systematic method of planned, proactive vehicle inspection along with servicing and repairs performed at specific intervals. Effective equipment management requires that repairs be made before failure. This involves a preventive maintenance approach to provide for systematic, periodic servicing of equipment to facilitate operations minimum downtime.

Planning and scheduling PM activities requires providing the right maintenance at the right time at the lowest overall cost. Combining these factors requires fleet managers to understand operating and maintenance characteristics to customize an effective preventive maintenance program.

Scheduled Preventive Maintenance Program

Scheduled Preventive Maintenance (PM) is the heart and soul of all efficient fleet management operations. An effective PM program will reduce peaks and valleys in repair volume. Sound PM programs enhance risk management. A well-maintained vehicle is usually a safer vehicle. In addition to safety, the documentation included in a proactive PM program can be invaluable in the courtroom.

Planning a Preventive Maintenance Program

Perhaps the most essential concept of a PM program is flexibility. Each organization must establish PM service parameters specific to its own budgetary and quality constraints.

Operator Responsibilities

An operator has a responsibility for his/her particular piece of equipment and is expected to inspect this equipment daily, checking tires to ensure proper inflation and condition, checking for fluid leaks, lubricant levels, belt conditions, battery connection and cleanliness, lights, signals and horn, windshield wipers, and wiper fluids and reporting any problems. For equipment which requires a Commercial Driver's License, federal law dictates a specific driver checklist. Vehicle Service Technicians need to know the details of daily operations and defects.

Scheduling Preventive Maintenance

Scheduling intervals allow for a determination of when and how often a PM activity will be performed. Local usage and environmental conditions, as well as manufacturer's recommendations, should be taken into account when establishing PM schedules.

Typically, agencies indicate that their PM program schedule is determined by:

- Manufacturers' recommendations for routine maintenance inspections;
- Incremental indicators such as mileage, elapsed time, engine hours, or fuel consumption;
- Service levels to determine what will be inspected and what maintenance tasks will be carried out at various service intervals (done in addition to general, routine tasks; also can be sophisticated enough for the scheduling of non-normal PM, e.g. brake pad replacements, etc); and
- Technician availability, shop designation, and user convenience.
- Adjustments to schedule – increased or shortened intervals – based on a particular fleet's experience due to particular use and availability of equipment, etc.

Service Intervals

PM intervals and service levels are initially based on manufacturer recommendations for vehicle maintenance. In addition to guidance from manufacturers and other outside sources, fleet managers use a variety of other resources to customize their PM programs, notably the past performance of similar equipment in the fleet from vehicle

history files, other's experience with similar vehicles, and demands made on vehicles, such as continuous service, dirty operating conditions, and extreme temperature ranges. The following are the most common measures of service intervals other than manufacturers' recommendations.

Time - Time is frequently used as a PM service interval. In systems based on time intervals, vehicles and equipment are serviced annually, semi-annually, quarterly, monthly, and daily or by hours of service. For example, setting a PM schedule up to service a unit every x-number of miles or x-number of days will ensure that even if the odometer data is corrupted, the unit will be rotated into the schedule for service and will not be overlooked.

Mileage – Is a common method of determining service intervals. Vehicles using mileage as a service interval are scheduled to be serviced after traveling a predetermined distance. This is a time proven method that is most effective on units that have high mileage applications or trip patterns.

Hours – Trip characteristics of some vehicles in public fleets require significant engine operating time although the vehicles display a low mileage rate. Engine hours are often a better indicator of wear and, therefore, are a better indicator of PM requirements. Construction, stationary and heavy equipment often have hour meters as opposed to mileage odometers. This equipment mandates hours as a service interval.

Total Fuel Usage – There are several reasons that agencies have begun to use fuel consumption as the criteria for PM interval scheduling. Combined with recorded travel distance, or hours of operating time, fuel consumption realistically reflects what is happening to an engine. An automated fuel transaction system can facilitate updates of PM schedules when interfaced with the automated PM system.

Either/Or – Most current automated information systems provide the opportunity to schedule PM's on the basis of so many miles/hours, so much time expired, or so much fuel consumed. This provides the greatest control over what is happening with the equipment.

Environmental conditions – Managers also consider demands made on vehicles by use, seasons, and terrain.

Service Checklists

Servicing of equipment can be thought of as having progressive stages or levels. There are three levels commonly identified, but it is possible to add more levels to accommodate various circumstances and types of equipment.

“A” Level Service or Level One Service – Systematic inspection of the unit (including the outside, under the hood, underneath the vehicle, and inside the cab) is often a part of the “A” servicing level.

“B” Level Service or Level Two Service – Service typically includes all the elements of the A service plus inspection of components having a high rate of wear or deterioration or a proven need for frequent adjustment. It includes such things as oil and filter changes, addition of transmission oil and hydraulic fluids, clutch adjustments, brake lining inspection and brake adjustments, engine running condition check, and adjustments to meet manufacturers' specifications.

“C” Level Service or Level Three Service – Service typically includes all the elements of the A and B inspection plus a thorough check and inspection of all remaining components and assemblies. “C” activities may include additional services such as front end alignments, transmission service, diesel fuel filters, hydraulic filters, engine tune-up, and drive train adjustment.

The Equipment Maintenance administrative staff processes the preventive maintenance schedules for vehicles/equipment. The clerical staff run a report for preventive maintenance based on odometer readings from fuel uploads and computer system reports or based on time between inspections. Departments are then notified by phone, fax or email of all scheduled equipment due for inspection.

The department/division is responsible for delivering the equipment to the assigned repair/PM location. The person delivering the vehicle/equipment for preventive maintenance is responsible for notifying the supervisor of their arrival. If there is any additional work they want to have done on the vehicle during the inspection, they fill out Form BFD 2000 (Equipment Condition Report). They are to include the unit number & mileage, specify work needed done, and designate who to contact when work is completed or if there is a question (sample "1" attached).

The City Department/Division can contact the shop supervisor to make arrangements if a special need arises to deviate from the preventative maintenance schedule. If vehicles/equipment is scheduled for maintenance and an emergency arises, it is the responsibility of the operator or supervisor to contact the Fleet Repair Shop to reschedule. These types of emergencies happen on a fairly regular basis. The repair division is very flexible when it comes to scheduling the PM's needed.

In conjunction with the manufacturer recommended intervals, the Equipment Maintenance Section has developed preventive maintenance intervals. These interval schedules may change due to equipment availability and repair trends on units. The Fleet Supervisors are responsible for ensuring the city vehicles and equipment have regular preventive maintenance completed.

CITY OF MILWAUKEE B.F.D. 2000 EQUIPMENT CONDITION REPORT

EQUIP# _____

DATE _____

MILEAGE _____

REPORT# _____

R.O.# _____

TECHNICIAN _____

CHECK ALL PERTAINING ITEMS.
SPECIFY EXACT PROBLEM IN THE REMARKS AREA.

BRAKES		SUSPENSION		HYDRAULICS	
STARTER		HORN		P.T.O.	
CHARGING SYSTEM		LIGHTS		BATTERY	
W/S WIPERS		EXHAUST		COOLING SYS	
GAUGES		PACKER CONTROL		DRIVE TRAIN	
MIRRORS		SENSOR		PLOW	
SEAT BELTS		AIR SYSTEM		STEERING	
TACHOGRAPH		TIRES		WINDOWS	

LEAVE KEYS IN PROPER LOCATION.

REMOVE ALL PERSONAL PROPERTY AND SECURE TOOLS AND EQUIPMENT.

REMARKS: _____

OPERATOR SIGNATURE: _____

TECHNICIAN

COMMENTS: _____

Preventive Maintenance Forms

Safety inspections and preventive maintenance of vehicles is the key to a good equipment maintenance operation. Each (PM) is completed as per guidelines set and listed on the checklist for that scheduled PM. Safety is a key and an important part of our organization. Therefore, safety sensitive items and equipment are inspected and/or repaired on each and every PM checklist.

The basic PM is an A-PM which checks the vehicle from front to rear and interior to exterior, all lights and all fluid levels.

The B-PM includes all the items listed on the A-PM checklist. It also may include changing oil, oil filters and brake adjustments.

The C-PM includes all the items listed on the A-PM and the B-PM checklist. It includes changing air, power steering and transmissions filters. It also includes engine oil, differential, hydraulic oil and transmission fluid change, coolant filter change, air dryer cartridge replacement and battery post and cable cleaning.

Due to the variety of equipment, there may be additional items included on either an A, B, or C PM. Each PM sheet is exclusive to the type of equipment being serviced.

Inspections and preventive maintenance invariably leads to repairs and/or replacement. The work associated with these repairs are accounted for and tracked separately from the inspections and PM's.

The inspection and preventive maintenance forms are included for light equipment and the various types of heavy equipment.

Repair Orders and Pre-Trip Inspections

All maintenance and repair work, including quick fixes, are issued a Repair Order. Computer generated repair orders are issued one of two ways; when an operator brings equipment into a repair location or when a repair is noted during a PM.

The repair order shows a work order number which is used to reference all activity involved with each repair such as parts ordered, labor charged and a description of the work that is done. It also shows commercial charges for outside services to the vehicle.

The Repair Supervisors review the completed repair orders on a daily basis to ensure all information is correct.

Another way to identify equipment repairs needed is through the Pre-Trip Inspection Form (sample "2" attached). Operators fill out this form each time they use a piece of equipment. Any damage or items requiring attention are noted at the time of the inspection. That information is placed on the BFD2000 form at the end of the shift and turned into the repairs section to be repaired.

DAILY PRE-TRIP INSPECTION

✓ **Check box to show that you have checked item and that it is OK**

☐ **Tires** for inflation/wear/damage

☐ **Lights** for proper operation

☐ **Fluid** levels including engine oil, transmission, fuel, radiator, hydraulic & batteries.

Be sure to check your fuel level before leaving the yard!

☐ **Windows/wipers** for damage and wiper blade proper functioning

☐ **Leaks** showing prior to moving equipment from parking spot

☐ **Air Cleaner** for air restrictions/replacement needed

☐ **Gauges** for proper operation

☐ **Controls** for proper operation

☐ **Brakes** visual inspection for proper adjustment

☐ **Hoses/Belts** for leaks or damage/and tension on belts

☐ **Body Damage** for visible damages/new paint scrapes

☐ **Other Items Required** while performing a CDL Pre-Trip Inspection

☐ **Completed a Repair Form BFD 2000 listing all items requiring attention / repair**

PM Compliance By Location

2007

Location	Total PM's	Early		Late		Within Target	
		Qty	%	Qty	%	Qty	%
HVY	166	26	16%	46	28%	94	57%
HV2	976	46	5%	145	15%	785	80%
LGT	1,342	478	36%	170	13%	694	52%
LNC	1,117	40	4%	67	6%	1,010	90%
NW	612	18	3%	63	10%	531	87%
TOWER	1,217	208	17%	171	14%	838	73%
Grand Totals	5,430	816	15%	662	12%	3,952	73%

2006

Location	Total PM's	Early		Late		Within Target	
		Qty	%	Qty	%	Qty	%
HVY	131	13	10%	76	58%	42	32%
HV2	508	60	12%	340	67%	108	21%
LGT	1,242	329	26%	343	28%	570	46%
LNC	1,115	46	4%	161	14%	908	81%
NW	850	21	3%	163	21%	666	78%
TOWER	659	77	12%	209	32%	373	57%
Grand Totals	4,505	546	12%	1,292	29%	2,667	59%

Highlights from 2006 to 2007:

- PM's performed within target improved by 14%
- The number of late PM's performed decreased by 59%

Percent of Work Orders

PM vs. Repair

2007

PM Work Order Count

Light	1,355
Heavy	4,560
Police	1,959
Total	7,874

Repair Work Orders	31,110
PM Work Orders	7,874
Total – All Work Orders	38,984

PM Work Load (% of all Work Orders)	25.3%
-------------------------------------	-------

Fleet Services uses two types of Work Order designations, "Repair" and "PM." The above chart shows the numbers and overall percentage of Work Orders that were opened using these labels. The procedures for the operation of our shop dictate that only minor repairs discovered in the course of a PM inspection are done on PM Work Orders. Other repairs found, while not a breakdown and technically could be considered "preventive," are performed on REPAIR Work Orders. Items found that are not disabling and are repaired at a later date are likewise performed on REPAIR Work Orders.

Preventive Maintenance Committee

The PM Committee oversees the PM's process. They have been charged with reducing the number of PM's that are performed either late or early. They meet on a monthly basis to work out the problems that have been inherent in performing PM's on time. Letters from the committee to department officials go out for any vehicle more than 60 days late.

In 2007, committee efforts have increased the number of PM's completed by over 900 and have increased the percentage of on time PM's from 59% to 73%.

PM Committee



From left to right Jim Strehlow, Brad Morin, Chris Frahm, Richard Rutten, Al Bartell, Pat Brushafer

Call In Procedure – Light Repairs

The PM report is generated by the Supervisor or clerical staff. The Fleet Equipment Service Writer will contact the using departments to request the vehicles be brought into Central Garage for the needed PM. The using department is not told which day the vehicle is needed; they are requested to bring the vehicle during a specific week. If the vehicle does not show, the supervisor will make the call asking that the vehicle be brought in. If that does not work, as a last resort, we will make one more call and tell them the fuel card will be shut off if the vehicle does not show up for the required PM.

PM Scheduling Information Light Equipment

Class Code	Description	Time Interval	Miles or Hours	Task	Schedule Updated Based On
PM-LGT	LIGHT EQUIPMENT PM	6 Months		A	UNIT IN
		12 Months	3000	B	UNIT IN
		6 Months		A	UNIT IN
		12 Months	3000	C	UNIT IN
PM-LGT-S	LIGHT SPECIAL EQUIPMENT PM	12 Months		C	UNIT IN
PM-LGT-T	LIGHT TRACTOR PM	6 Months		A	UNIT IN
		12 Months		C	UNIT IN
PM-LGT-X	LIGHT EQ. EXTREME DUTY	4 Months	3000	A	UNIT IN
		4 Months	3000	B	UNIT IN
		12 Months	3000	C	UNIT IN

Call In Procedure - Heavy Repairs

The PM report is generated by the Supervisor or clerical staff. There are several ways vehicles are called in for their scheduled preventive maintenance:

- Vehicles due for PM's are put onto the "Call in Sheet". This call in sheet is the communication method to relay information from repairs second shift to Dispatch first shift. The Dispatch office then calls the using departments with a two day notice requesting vehicles to be brought in to a specific location for PM's.
- PM Call in sheets are faxed to the using department requesting vehicles be brought in the garage for PM. Usually this schedule is for the complete month.
- The vehicle is brought in to the repair facility for some needed repairs and the fleet management system flags the staff opening the work order of the needed PM.
- If a vehicle does not arrive for its PM, the call in sheet is marked as a "PM No Show" in the "Notes to Dispatch" section of the call in sheet. If a second request is made, that will be noted to the right of the equipment number. As a last resort a call is made informing the using department that the fuel card will be shut off if the vehicle is not brought in for the PM.

PM Scheduling Information - Heavy Equipment

Class Code	Description	Time Interval	Miles or Hours	Task	Schedule Updated Based On
PM-H-ABC	Heavy Equipment PM w/A Insp	1 Month		A	UNIT IN
				A	UNIT IN
				A	UNIT IN
				A	UNIT IN
				A	UNIT IN
		6 Months		B	UNIT IN
				A	UNIT IN
				A	UNIT IN
				A	UNIT IN
				A	UNIT IN
				A	UNIT IN
		12 Months		C	UNIT IN
PM-H-BC	Heavy Equipment PM w/o A Insp	6 Months		B	UNIT IN
		12 Months		C	UNIT IN
PM-H-SKD	Skid Loader PM Insp	4 Months	100	B	WORK FINISHED
PM-H-SPC	PM - Special Equipment Heavy	12 Months		C	SCHEDULED
PM-SWEEP	Sweeper PM	2 Months	100	B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
				B	UNIT IN
		12 Months		C	UNIT IN
PM-HVY-T	Heavy Tractor PM	6 Months	250	B	WORK FINISHED
				B	WORK FINISHED
				B	WORK FINISHED
				C	WORK FINISHED

Tire Shop

The tire shop services all of DPW along with the Police Department. The Tire Shop routinely repairs and changes over 5600 tires per year. There were over 3400 tire mountings and 3300 tire service calls in 2007. The Tire Shop is open from 5:30 am to 11:00 pm. This work is performed by only 5 employees. The Tire Shop is always looking for new ways to enhance the operation and the safety of the fleet regarding tires.

Currently the Tire Shop is involved in the installation of visual lug nut indicators, known as **Wheel Checks**. Lately there have been cases of commercial trucks that have lost tires while driving. Some of these incidents resulted in fatalities that could have been caused by loose wheel lugs. Fleet Services is currently testing a product called Wheel Check.



These pictures show the Wheel Check in place on a City Truck. These small plastic pointers will rotate if the wheel lugs loosen up. They are visible as the drivers do their pre-trip inspections, immediately alerting the driver of a problem.

